Formaldehyde in Northwest Aquaculture

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Background

- The NPDES Permits Unit requested that OERA staff conduct a study at Northwest aquaculture facilities to determine the concentrations of formaldehyde that occur in hatchery effluent after fish have been treated with Formalin.
- Formalin is an animal drug used to control external parasites on fish such as Salmon.
- Formalin is composed of 37% formaldehyde and 13% methanol plus inert ingredients.
- Fish are treated in either adult, juvenile, or egg stages.

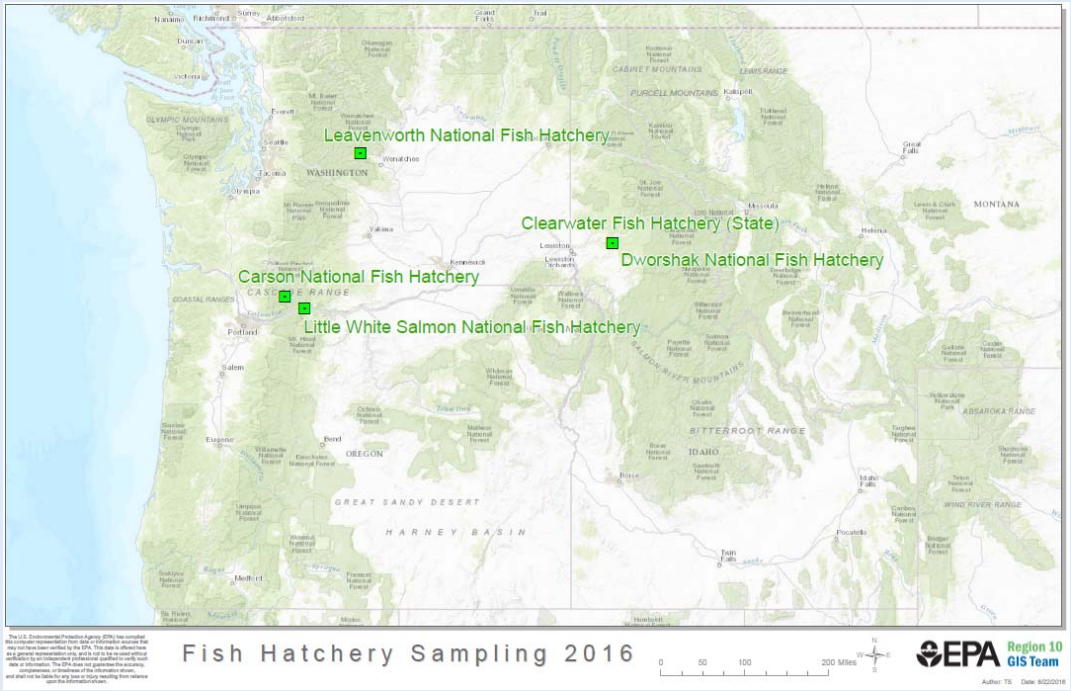
Preparation

- OERA staff assembled a team to determine data quality objectives and develop a quality assurance project plan (QAPP).
  - Considered previous published studies
  - Biological Assessment
  - NPDES Permits
  - Formalin Labeling (25ppm Formalin = ~10ppm formaldehyde)
- Also, needed to develop a health and safety plan (HASP).
  - Health and safety of sampling team
  - Bio-security concerns at hatcheries

Hatchery Locations

- Five Hatcheries Involved in the first stage of the study:
  1. Little White Salmon National Fish Hatchery
  2. Carson National Fish Hatchery
  3. Dworshak National Fish Hatchery
  4. Clearwater Fish Hatchery (State)
  5. Leavenworth National Fish Hatchery

  The Washington State Department of Ecology is planning to visit up to five WDFW hatcheries this fall.
- The facilities were targeted based on volume of Formalin used.



Sample Locations

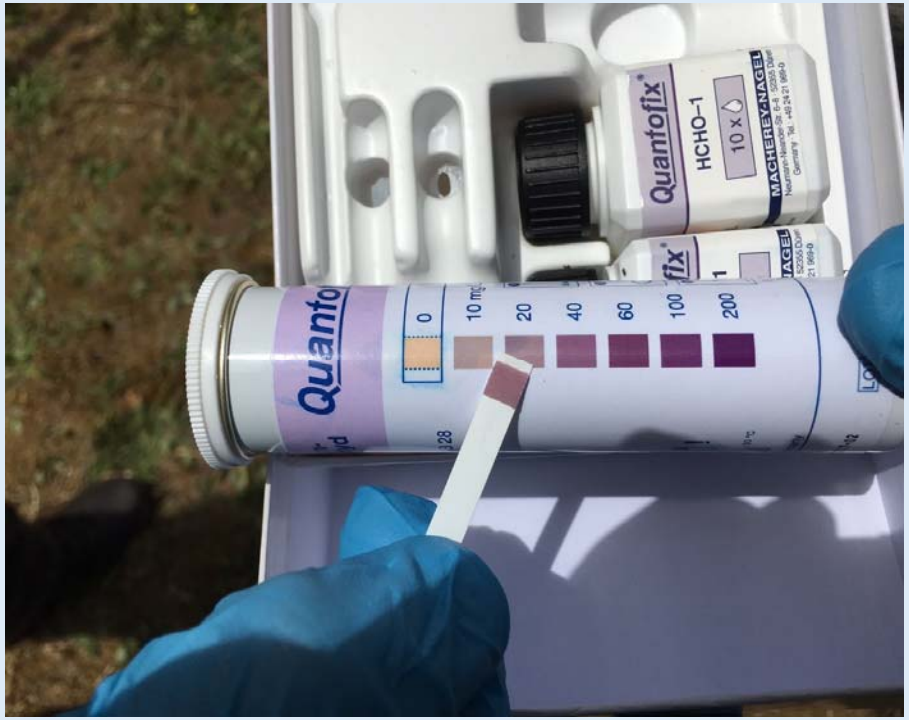
- Water samples were collected at the facility influent and effluent.
- Also collected a sample from the receiving water.
- Sample locations were documented with GPS.

Field Equipment

- Used Sigma 900 automated samplers to collect composite and timed discrete samples.
- Also collected grab samples.
- Water quality (temperature, pH, conductivity, turbidity, and dissolve oxygen) were measured with a Horiba multi-parameter water quality meter.

Screening-Level Field Analysis

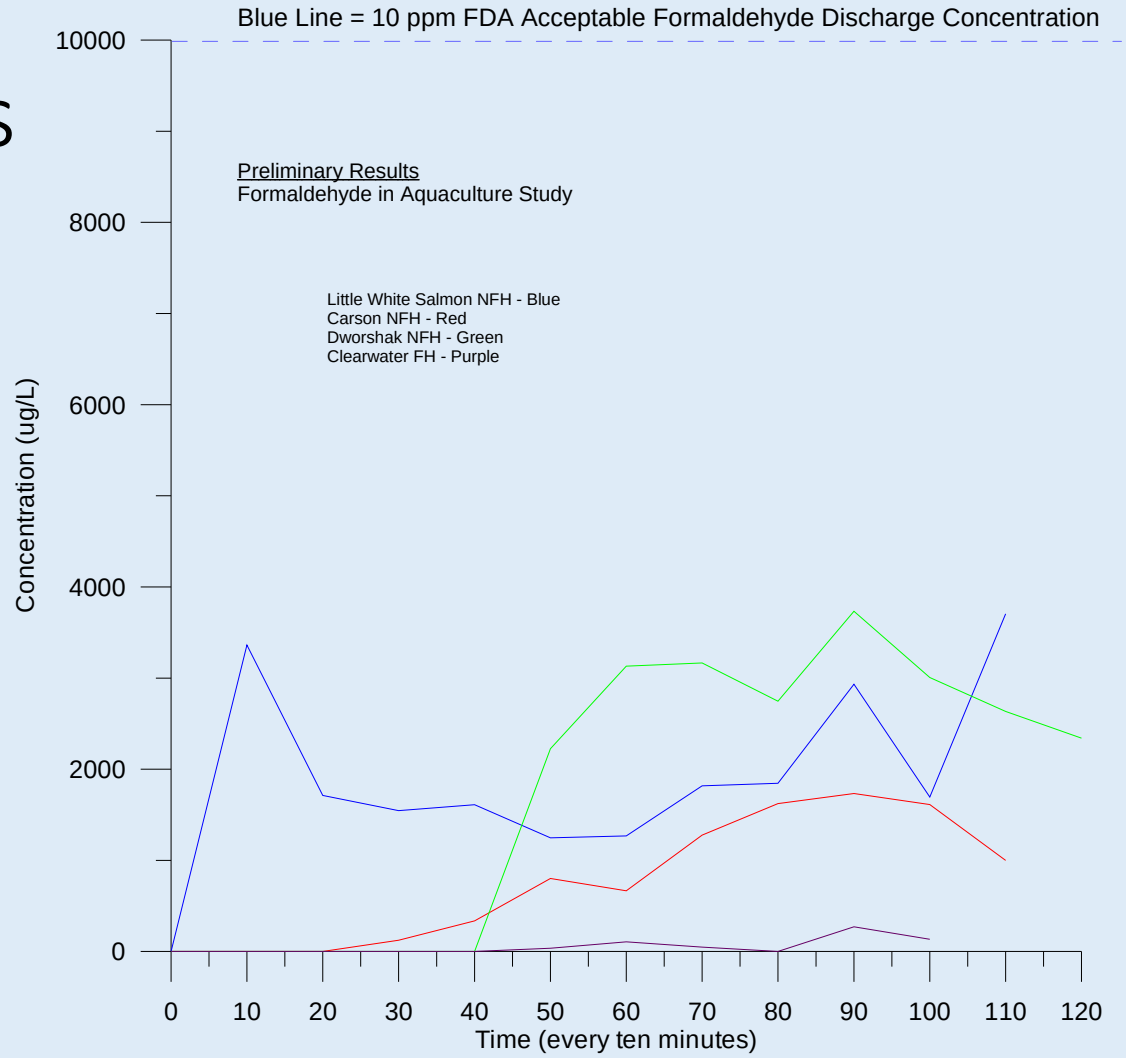
- Tested for chlorine, ammonia, and formaldehyde using test kits.



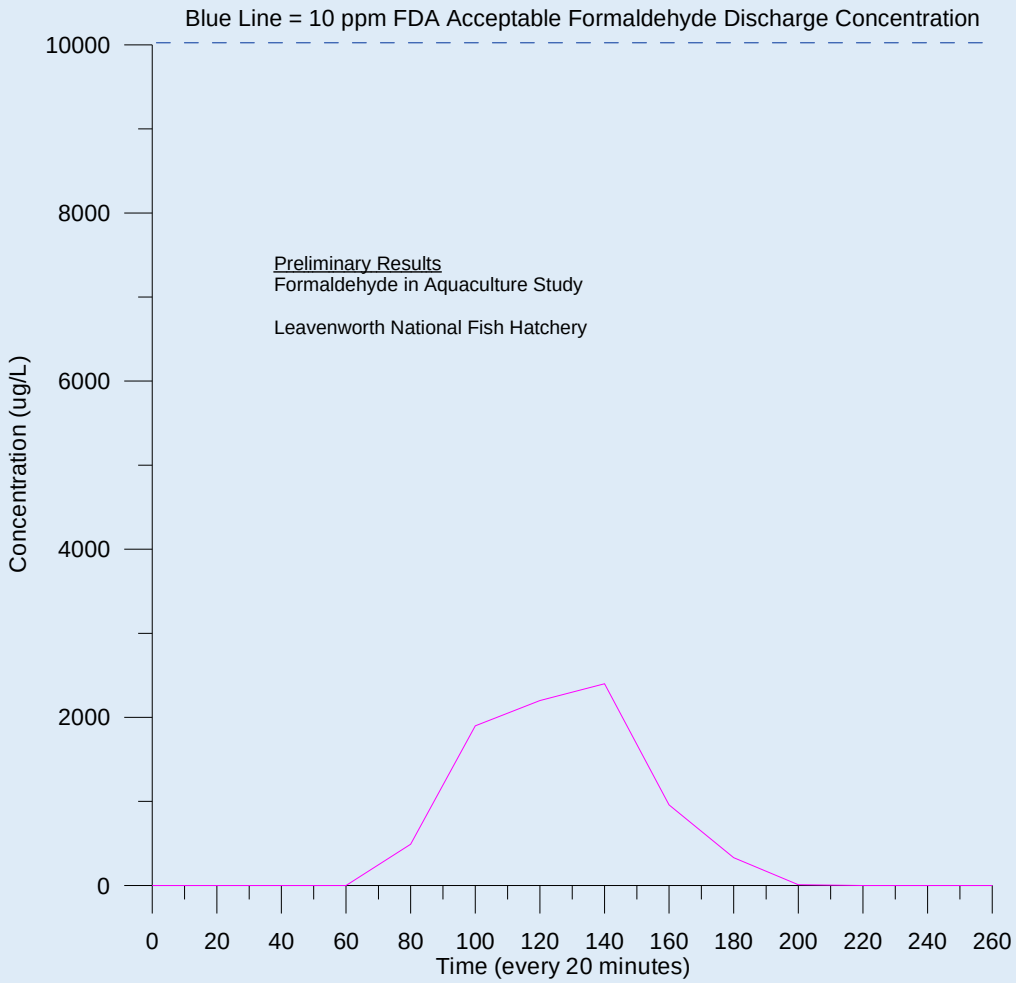
Analytical challenges

- Last formaldehyde analysis was >15 years ago
- HPLC used for that analysis long gone
- Methods (8315A, 1667) were written in 1980's, no surrogates!
- Unknown concentration ranges expected, interferences
- Short holding times for samples until derivatization (3 or 5 days)
- Both chlorine and ammonia may be present

Preliminary Results



More Preliminary Results



Summary of preliminary results

- Three hatcheries had peak concentrations between 2 and 4 ppm
- One hatchery with a large pond for dilution had a maximum observed concentration < 300 ppb
- One hatchery had the sampling pump shutdown. The maximum observed concentration, 3.7 ppm, was the last discrete sample taken.
- Target is < 10 ppm at discharge

Questions?

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